Instructions: Complete each of the following exercises for practice.

1. Evaluate the line integral $\displaystyle\int_{\partial R} P\,dx + Q\,dy$ via Green's Theorem.

   (a) $P(x,y) = ye^x$, $Q(x,y) = 2e^x$;
   $R = [0,3] \times [0,4]$

   (b) $P(x,y) = x^2 + y^2$, $Q(x,y) = x^2 - y^2$;
   R: triangle with vertices $(0,1)$, $(2,1)$, and $(1,0)$

   (c) $P(x,y) = y + e^{\sqrt{x}}$, $Q(x,y) = 2x + \cos(y^2)$;
   R: the region bounded by $y = x^2$ and $x = y^2$

   (d) $P(x,y) = y^4$, $Q(x,y) = 2xy^3$;
   R: the ellipse $x^2 + 2y^2 \leq 2$

   (e) $P(x,y) = y^3$, $Q(x,y) = -x^3$;
   R: the ball $x^2 + y^2 \leq 4$

   (f) $P(x,y) = 1 - y^3$, $Q(x,y) = x^3 + \exp(y^2)$;
   R: the annulus $4 \leq x^2 + y^2 \leq 9$

2. Evaluate $\displaystyle\int_C \mathbf{F} \cdot\, d\mathbf{r}$ via Green's Theorem.

   (a) $\mathbf{F} = \langle y\cos(x) - xy\sin(x), xy + x\cos(x)\rangle$
   C: the triangle with vertices $(0,0)$, $(0,4)$, $(2,0)$

   (b) $\mathbf{F} = \left\langle e^{-x} + y^2, e^{-y} + x^2\right\rangle$
   C: the arc of $y = \cos(x)$ from $(-\frac{\pi}{2}, 0)$ to $(\frac{\pi}{2}, 0)$ and then the segment connecting $(\frac{\pi}{2}, 0)$ to $(-\frac{\pi}{2}, 0)$

   (c) $\mathbf{F} = \langle y - \cos(y), x\sin(y)\rangle$
   C: the clockwise circle $(x-3)^2 + (y+4)^2 = 4$

   (d) $\mathbf{F} = \left\langle \sqrt{x^2+1}, \arctan(x)\right\rangle$
   C: the triangle with vertices $(0,0)$, $(1,1)$, $(0,1)$